

This file is available for free download at <http://www.iluvmyrx7.com>

This file was not scanned to deprive Mazda of any money - it was scanned due to the rareness of the original manuals and the overwhelming need of the RX-7 owner to have this information so that they can accurately troubleshoot problems. Perhaps if Mazda's dealerships could support the Rotary Engine it wouldn't be so necessary for the owners to do so.



Many thanks to Lenny Terris for scanning this.

Before beginning any service procedure, refer to the 1994 RX-7 Body Electrical Troubleshooting Manual; see section S for air bag system service warnings and section J1 for audio anti theft system alarm conditions.

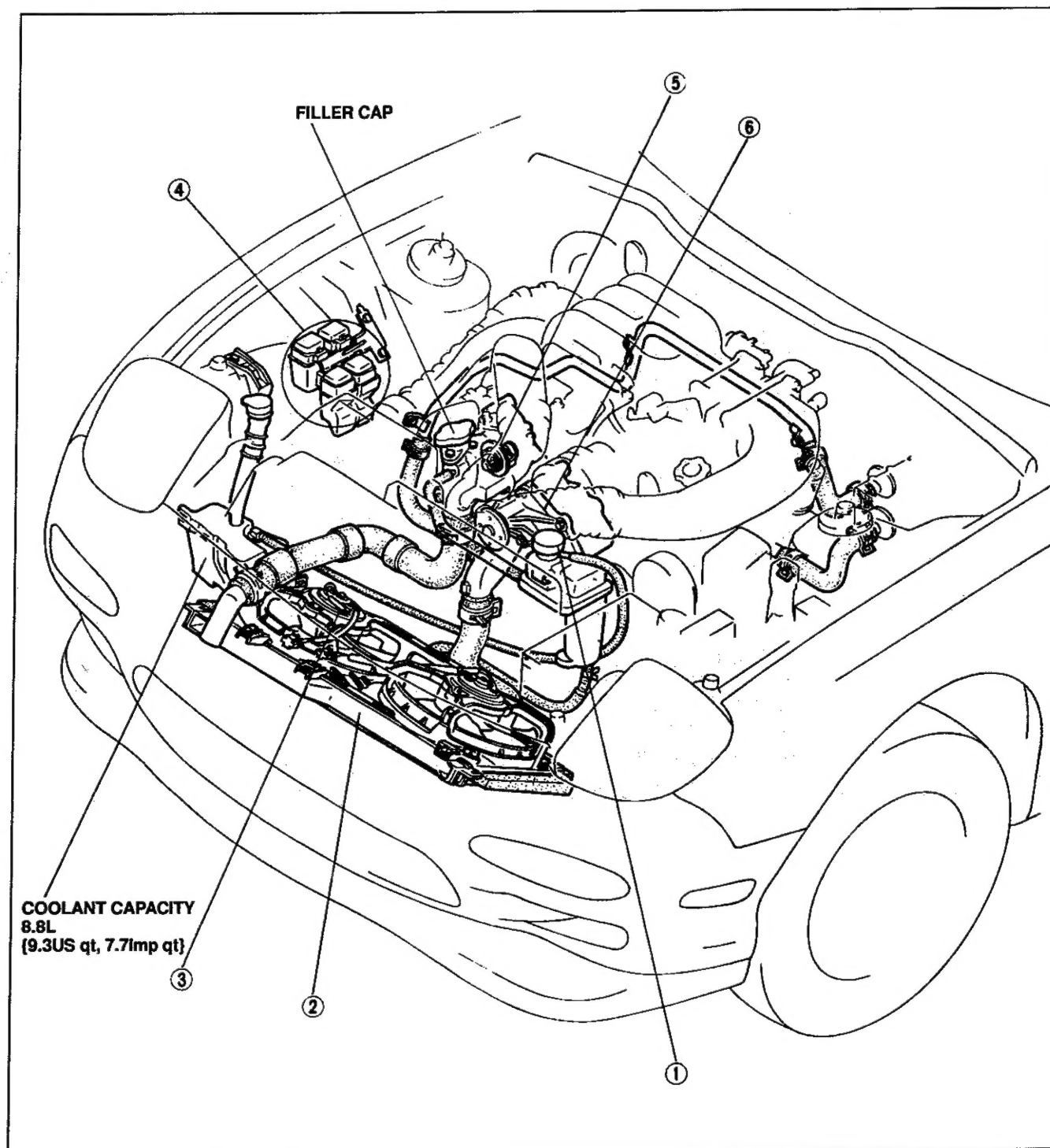
E

## COOLING SYSTEM

INDEX .....	E - 2
OUTLINE .....	E - 3
SPECIFICATIONS .....	E - 3
TROUBLESHOOTING GUIDE .....	E - 3
ENGINE COOLANT .....	E - 4
PREPARATION .....	E - 4
INSPECTION .....	E - 4
REPLACEMENT .....	E - 5
RADIATOR CAP .....	E - 7
PREPARATION .....	E - 7
INSPECTION .....	E - 7
RADIATOR AND COOLANT FAN .....	E - 8
REMOVAL / INSTALLATION .....	E - 8
INSPECTION .....	E -10
REPLACEMENT .....	E -12
COOLANT FAN RELAY .....	E -13
REMOVAL / INSTALLATION .....	E -13
INSPECTION .....	E -13
THERMOSTAT .....	E -14
REMOVAL / INSTALLATION .....	E -14
INSPECTION .....	E -15
WATER PUMP AND WATER	
THERMOSENSOR .....	E -15
REMOVAL / INSTALLATION .....	E -15
INSPECTION .....	E -17

E

## INDEX



1. Radiator cap	
Inspection .....	page E- 7
2. Radiator	
Removal / Installation .....	page E- 8
Inspection .....	page E-10
3. Coolant fan motor	
Inspection .....	page E-11
Replacement .....	page E-12

4. Coolant fan relay	
Removal / Installation .....	page E-13
Inspection .....	page E-13
5. Thermostat	
Removal / Installation .....	page E-14
Inspection .....	page E-15
6. Water pump and water thermostats	
Removal / Installation .....	page E-15
Inspection .....	page E-17

# OUTLINE

## SPECIFICATIONS



Item		Engine model	13B Turbo
Cooling system			Water-cooled, forced circulation
Coolant capacity		L {US qt, Imp qt}	8.8 {9.3, 7.7}
Water pump	Type		Centrifugal
	Water seal		Unified mechanical seal
Thermostat	Type		Wax, bottom-bypass
	Opening temperature	°C {°F}	80.5–83.5 {177–182}
	Full-open temperature	°C {°F}	95 {203}
	Full-open lift	mm {in}	8–10 {0.31–0.39}
Radiator	Type		Corrugated fin
	Cap valve opening pressure	kPa {kgf/cm <sup>2</sup> , psi}	113–142 {1.15–1.45, 16.4–20.6}
Coolant fan	Motor current	A	High: 10.6–16.6, Med: 6.5–12.5, Low: 5.8–11.8
	Number of blades		No.1: 5, No.2: 4
	Outer diameter of blades	mm {in}	No.1, No.2: 300 {11.8}

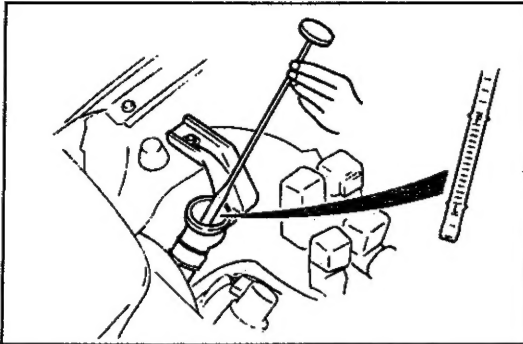
## TROUBLESHOOTING GUIDE

Problem	Possible cause	Action	Page
Overheating	Coolant level insufficient	Add	E-5
	Coolant leakage	Repair	—
	Radiator fins clogged	Clean	E-10
	Radiator cap malfunction	Replace	E-7
	Coolant fan malfunction	Replace	E-11
	Thermostat malfunction	Replace	E-15
	Water passage clogged	Clean	E-5
	Water pump malfunction	Replace	E-16
Corrosion	Impurities in coolant	Replace	E-5

## ENGINE COOLANT

PREPARATION  
SST

<p>49 9200 145</p> <p>Adapter set, radiator cap tester</p> 	<p>For inspection of cooling system pressure</p>	<p>49 9200 146</p> <p>Adapter A (Part of 49 9200 145)</p> 	<p>For inspection of cooling system pressure</p>
--	--	--	--



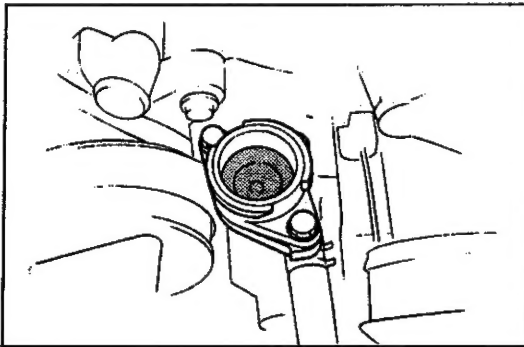
## INSPECTION

## Coolant Level (Engine cold)

1. Verify that the coolant level is near the filler neck.
2. Verify that the coolant level on the dipstick is between the F and L.
3. Add coolant if necessary.

## Note

- The distance between the L and F marks on the dipstick represents 1.0 Liter {1.1 US qt, 0.9 Imp qt}.



## Coolant Quality

## Warning

- Removing the radiator cap or the coolant filler cap while the engine is running, or when the engine and radiator are hot is dangerous. Scalding coolant and steam may shoot out and cause serious injury. It may also damage the engine and cooling system. Turn off the engine and wait until it is cool. Even then, be very careful when removing the cap. Wrap a thick cloth around it and slowly turn it counter-clockwise to the first stop. Step back while the pressure escapes. When you're sure all the pressure is gone, press down on the cap-still using a cloth-turn it, and remove it.

1. Verify that there is no buildup of rust or scale around the radiator cap or filler neck.
2. Verify that coolant is free of oil. Replace the coolant if necessary.

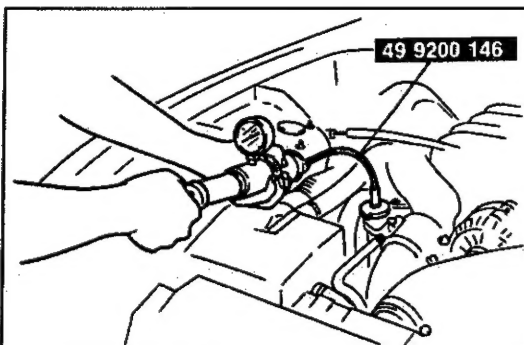
## Coolant Leakage

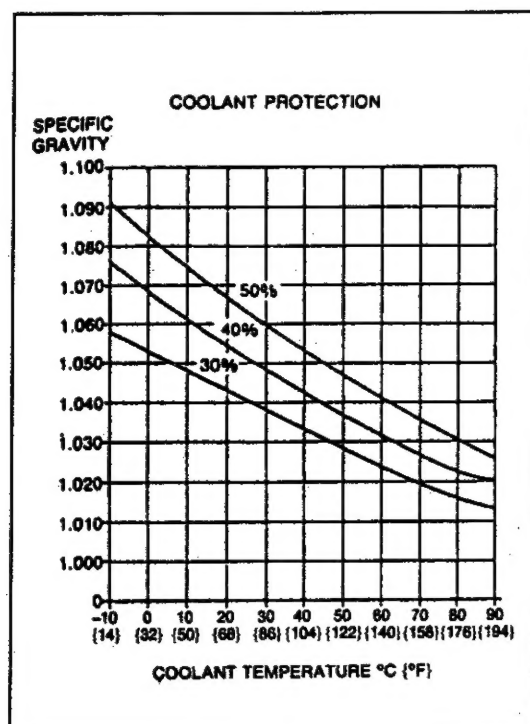
1. Connect a radiator tester (commercially available) and the SST to the radiator filler neck.

## Caution

- Applying more than 142 kPa {1.45 kgf/cm<sup>2</sup>, 20.6 psi} can damage the hoses, fittings, and other components, and cause leaks.

2. Apply 142 kPa {1.45 kgf/cm<sup>2</sup>, 20.6 psi} of pressure to the system.
3. Verify that the pressure is held.
4. If not as specified, check for coolant leakage.





### Coolant Protection

#### Caution

- The engine has aluminum parts that can be damaged by alcohol or methanol antifreeze. Do not use alcohol or methanol in the cooling system. Use only ethylene-glycol-based coolant.

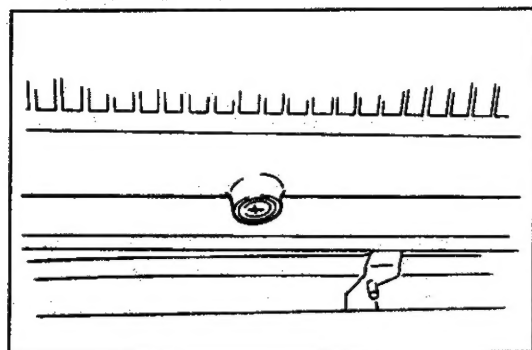
#### Caution

- Use only soft (demineralized) water in the coolant mixture. Water that contains minerals will cut down on the coolant's effectiveness.

- Measure the coolant temperature and the specific gravity with a thermometer and a hydrometer.
- Determine the coolant protection by referring to the graph shown.
- If the coolant protection is not proper, add water or coolant.

### Antifreeze solution mixture percentage

Coolant protection	Volume percentage		Gravity at 20°C {68°F}
	Water	Coolant	
Above -16°C {3°F}	65	35	1.054
Above -26°C {15°F}	55	45	1.066
Above -40°C {40°F}	45	55	1.078



### REPLACEMENT Draining

#### Warning

- Removing the radiator cap or the coolant filler cap while the engine is running, or when the engine and radiator are hot is dangerous. Scalding coolant and steam may shoot out and cause serious injury. It may also damage the engine and cooling system. Turn off the engine and wait until it is cool. Even then, be very careful when removing the cap. Wrap a thick cloth around it and slowly turn it counter-clockwise to the first stop. Step back while the pressure escapes. When you're sure all the pressure is gone, press down on the cap-still using a cloth-turn it, and remove it.

- Remove the radiator cap.
- Loosen the radiator drain plug.
- Drain the coolant into a container.
- Flush the cooling system with water until all traces of color are gone.
- Let the system drain completely.
- Install and tighten the drain plug.

**Refilling**

Use the proper amount and mixture of ethylene-glycol based coolant. (Refer to Coolant Protection, page E-5)

1. Slowly pour the coolant into the radiator up to the coolant filler neck.

**Filling pace:**

1.0 L {1.1 US qt, 0.9 Imp qt}/min. max

**Coolant capacity:**

8.8 L {9.3 US qt, 7.7 Imp qt}/min. max

2. Fill the coolant reservoir up to the F mark.
3. Securely install the radiator cap and the coolant filler cap.
4. Start the engine and let it idle about 10 minutes until it warms up.
5. If the coolant level warning light comes on while warming up, turn the engine off and inspect the drain plug and water hoses for leaks.
6. Stop the engine and allow it to cool.

**Warning**

- **Removing the radiator cap or the coolant filler cap while the engine is running, or when the engine and radiator are hot is dangerous. Scalding coolant and steam may shoot out and cause serious injury. It may also damage the engine and cooling system. Turn off the engine and wait until it is cool. Even then, be very careful when removing the cap. Wrap a thick cloth around it and slowly turn it counter-clockwise to the first stop. Step back while the pressure escapes.**

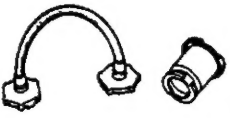

**When you're sure all the pressure is gone, press down on the cap-still using a cloth-turn it, and remove it.**

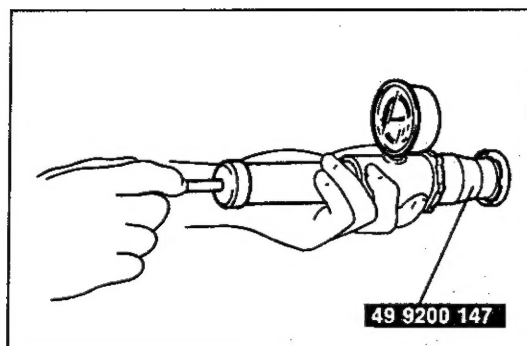
7. Check the coolant level. If it's low, repeat the procedure from step 1.
8. Fill the reservoir to the F mark.



## RADIATOR CAP

PREPARATION  
SST

<p>49 9200 145</p> <p>Adapter set, radiator cap tester</p> 	<p>For inspection of radiator cap valve</p>	<p>49 9200 147</p> <p>Adapter B (Part of 49 9200 145)</p> 	<p>For inspection of radiator cap valve</p>
--	---	---	---



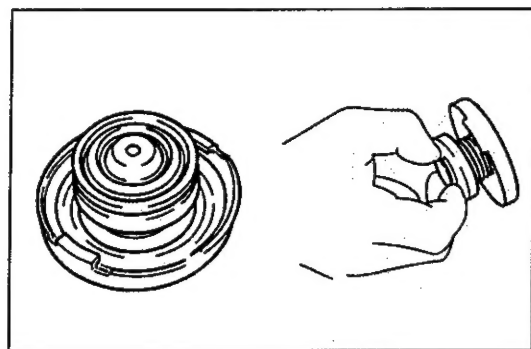
## INSPECTION

## Radiator Cap Valve

1. Remove foreign material (such as water residue) from between the radiator cap valve and the valve seat.
2. Attach the radiator cap to a radiator cap tester (commercially available) by using the SST. Apply pressure gradually to 113–142 kPa {1.15–1.45 kgf/cm<sup>2</sup>, 16.4–20.6 psi}.
3. Wait about 10 seconds. Verify that the pressure has not decreased.
4. If not as specified, replace the radiator cap.

## Negative Pressure Valve

1. Pull the negative pressure valve to open it. Verify that it closes completely when released.
2. Check for damage on the contact surfaces and for cracked or deformed seal packing.
3. Replace the radiator cap if a problem is found.



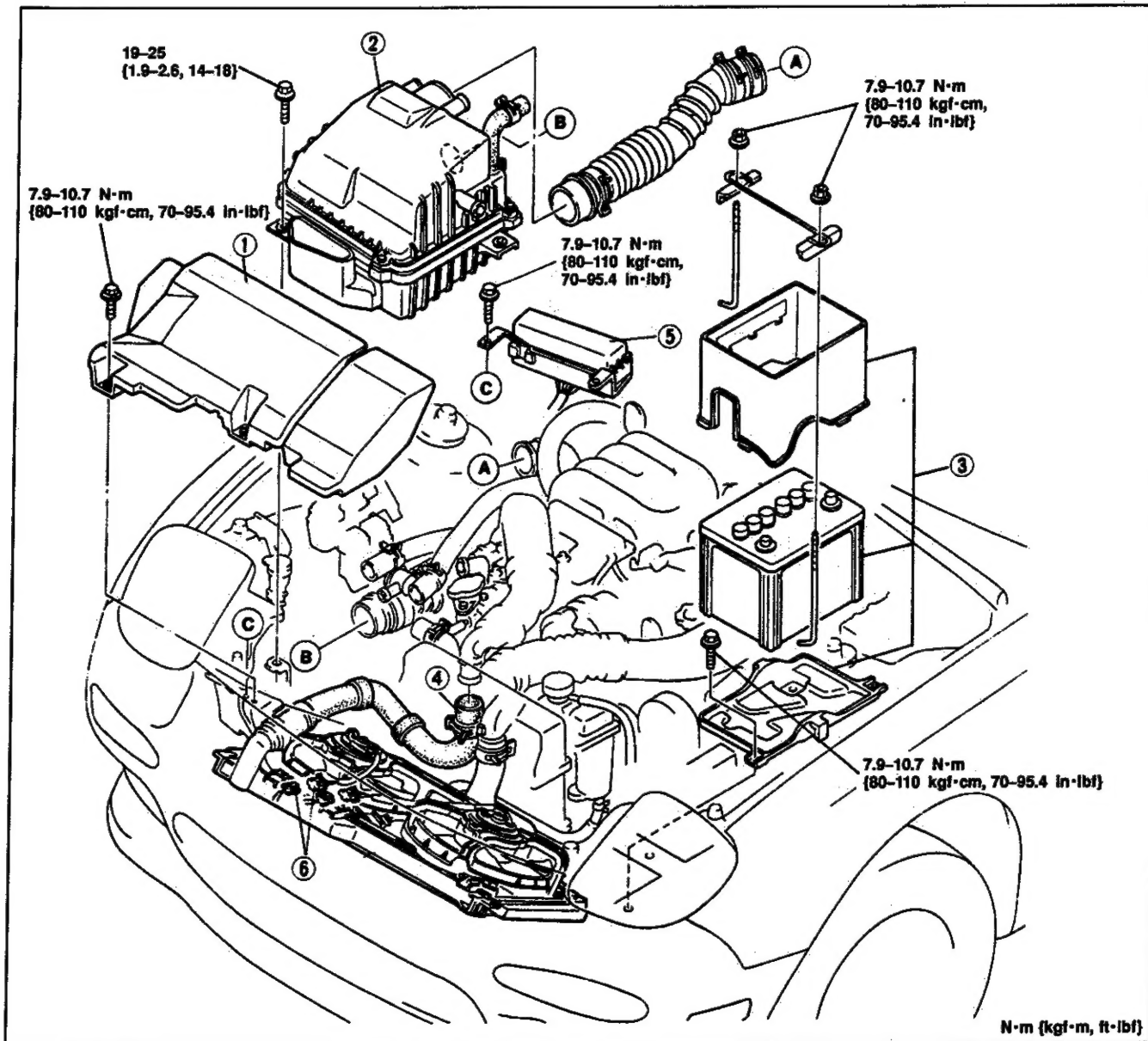


## RADIATOR AND COOLANT FAN

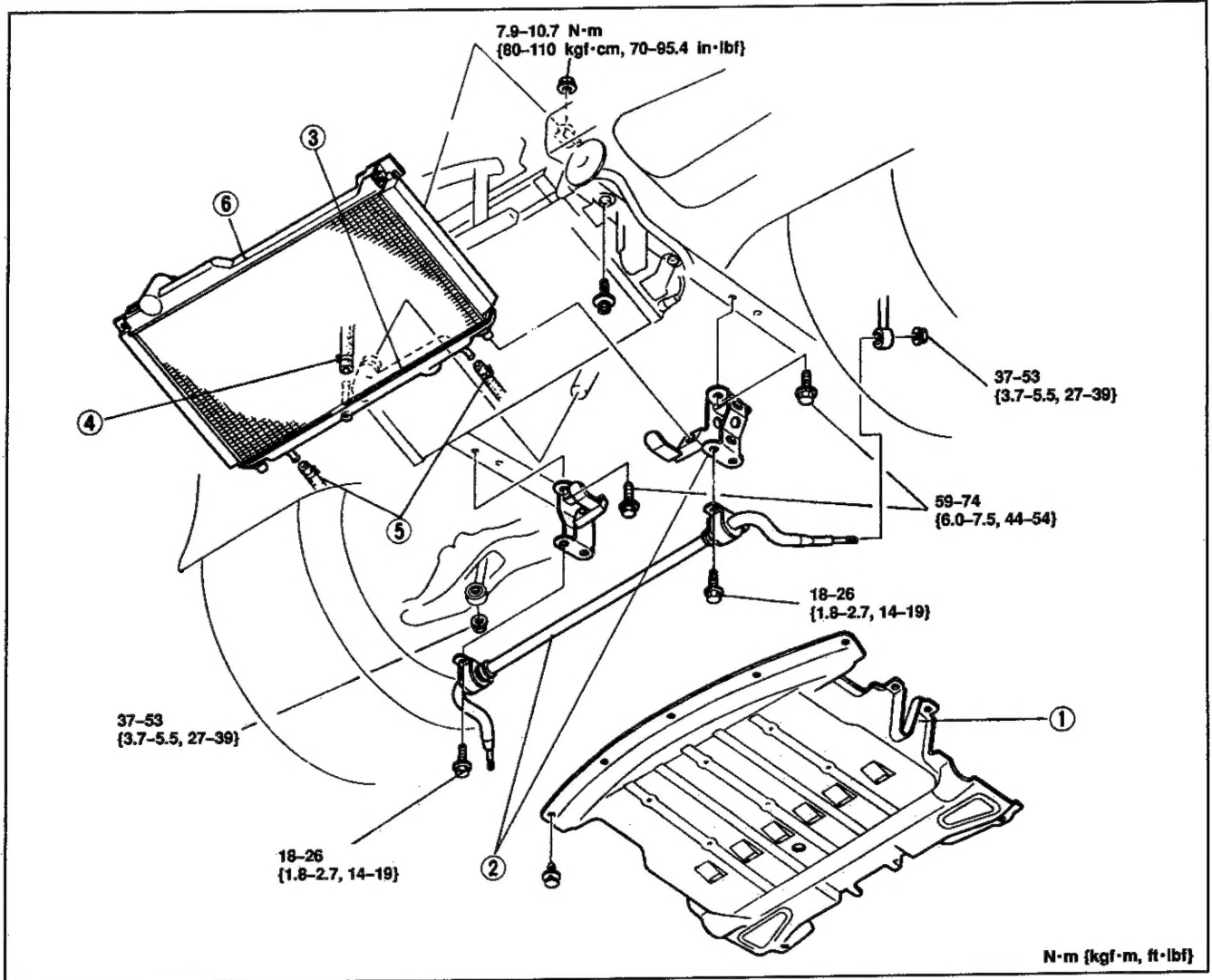
## REMOVAL / INSTALLATION

1. Disconnect the negative battery cable.
2. Drain the engine coolant. (Refer to page E-5)
3. Remove in the order shown in the figure, referring to Removal Note.
4. Install in the reverse order of removal.

## STEP 1

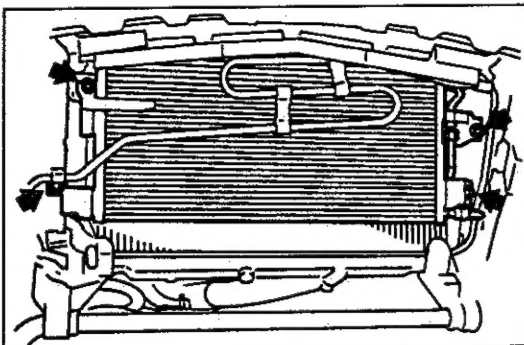


## STEP 2



1. Undercover
2. Stabilizer and bracket  
Removal/Inspection ..... Section R
3. Radiator hose (lower)
4. Air separation hose

5. Oil cooler hose (AT)  
Removal Note ..... below  
Inspection ..... page E-10
6. Radiator and coolant fan  
Removal Note ..... below  
Inspection ..... page E-10

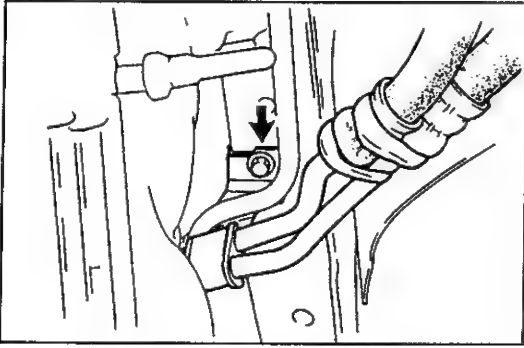


### Removal Note

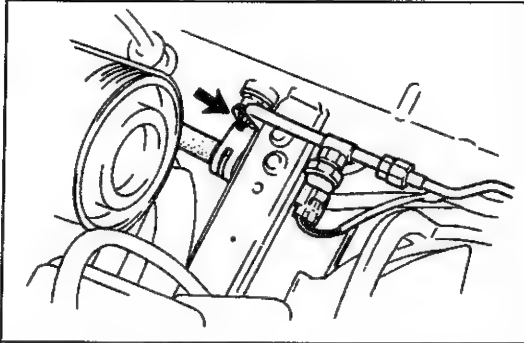
#### Radiator and coolant fan

While removing the radiator and cooling fan, do not disconnect the A/C piping.

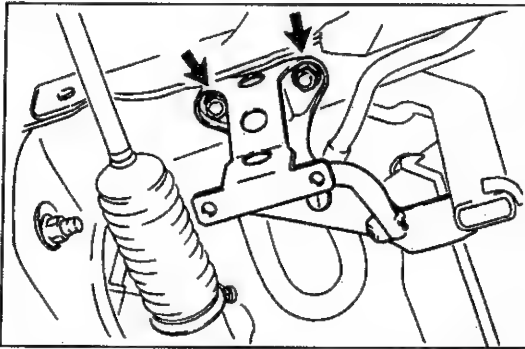
1. Remove the bolts shown in the figure.
2. Position the A/C condenser away from the radiator and secure it with wire.



3. Remove the P/S oil pump pipe bracket shown in the figure.

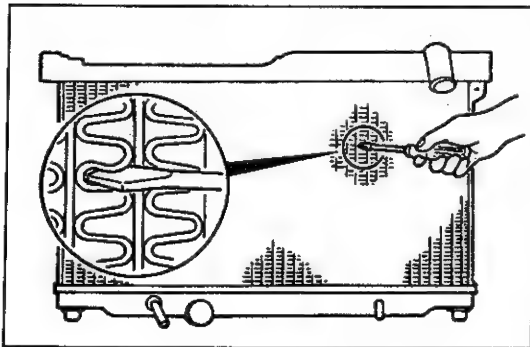


4. Remove the A/C compressor high-pressure pipe bracket as shown in the figure.



5. Remove the radiator bracket.

6. Remove the radiator and coolant fan.

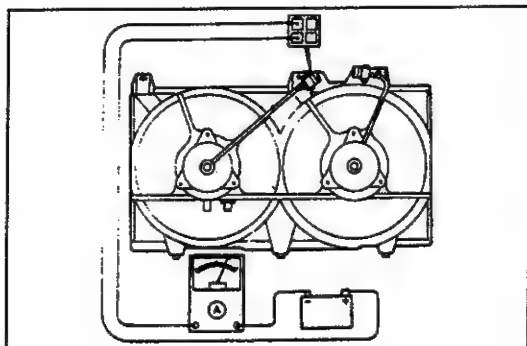


### INSPECTION

#### Radiator

Check for the following and repair or replace the radiator as necessary.

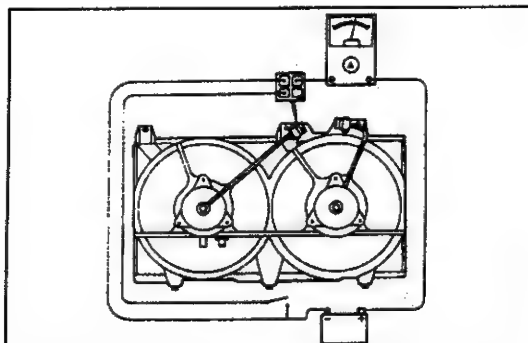
1. Cracks, damage and water leakage
2. Bent fins (repair with a screwdriver)
3. Damaged radiator inlet, outlet, and hose connectors



## Coolant fan motor

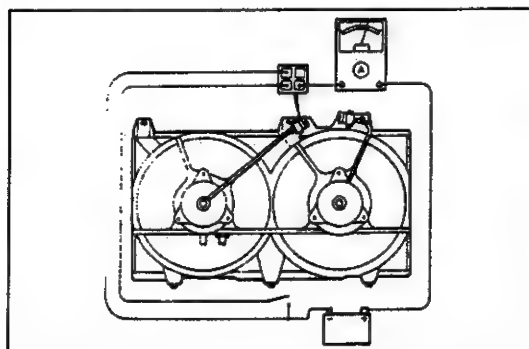
1. Verify that the battery is fully charged.
2. Disconnect the fan motor connectors.
3. Connect battery positive voltage and an ammeter as shown to the fan motor connector for low-speed inspection.
4. Verify that the fan motor operates smoothly at the standard current.

**Current: 5.8–11.8A**



5. Connect battery positive voltage, an ammeter, and a switch to the fan motor connector as shown for medium-speed inspection.
6. Verify that the fan motor operates smoothly at the standard current or less with the switch ON.

**Current: 6.5–12.5A**



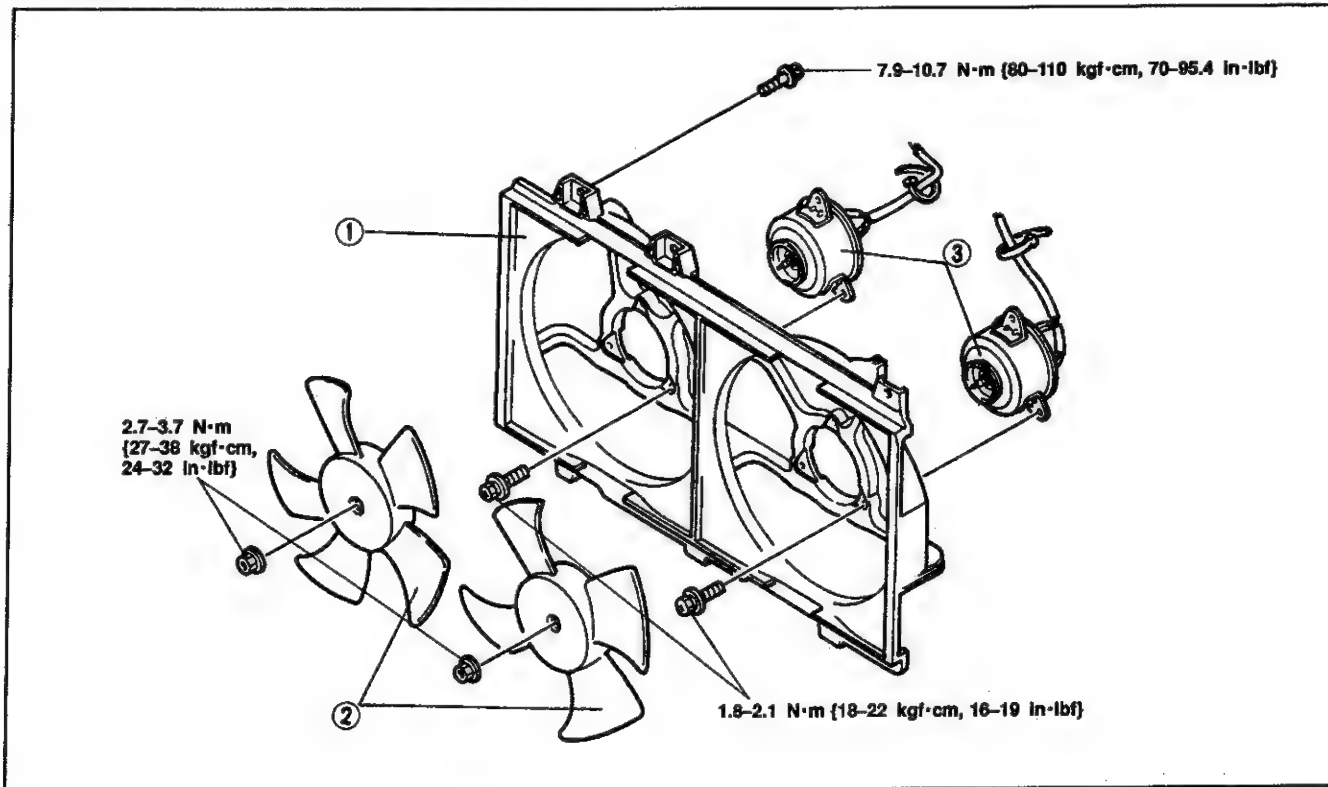
7. Connect battery positive voltage, an ammeter, and a switch to the fan motor connector as shown for high-speed inspection.
8. Verify that the fan motor operates smoothly at the standard current or less with the switch ON.

**Current: 10.6–16.6A**

9. Check the other fan motor as described above.
10. If a fan motor does not operate as specified, replace it.

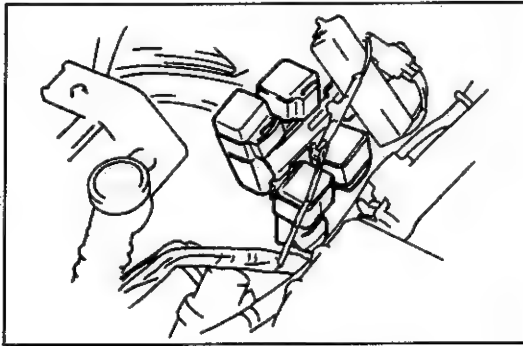
**REPLACEMENT**

1. Remove in the order shown in the figure.
2. Install in the reverse order of removal.



1. Radiator cowling
2. Coolant fan

3. Coolant fan motor

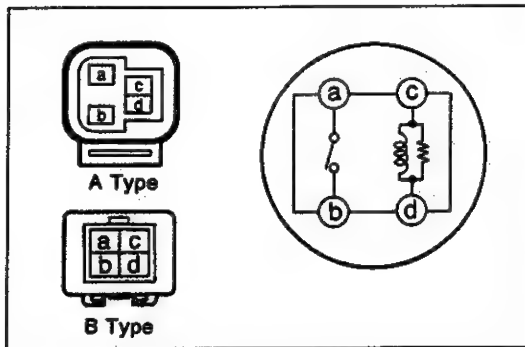
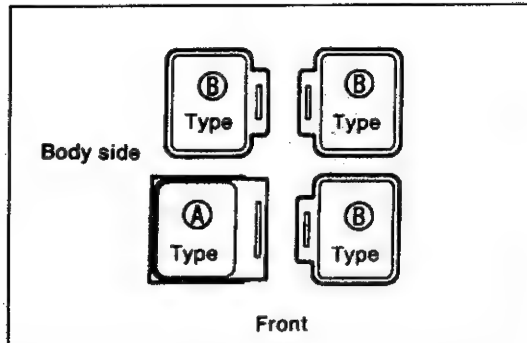


## COOLANT FAN RELAY

### REMOVAL / INSTALLATION

Slide the coolant fan relays off the bracket.

The relay positions are shown in the figure.



### INSPECTION

1. Check continuity of the relay as shown.

Terminal	Continuity
a-b	No
c-d	Yes

2. Apply 12V between terminals c and d.  
Check for continuity between terminals a and b.
3. If not as specified, replace the fan relay.

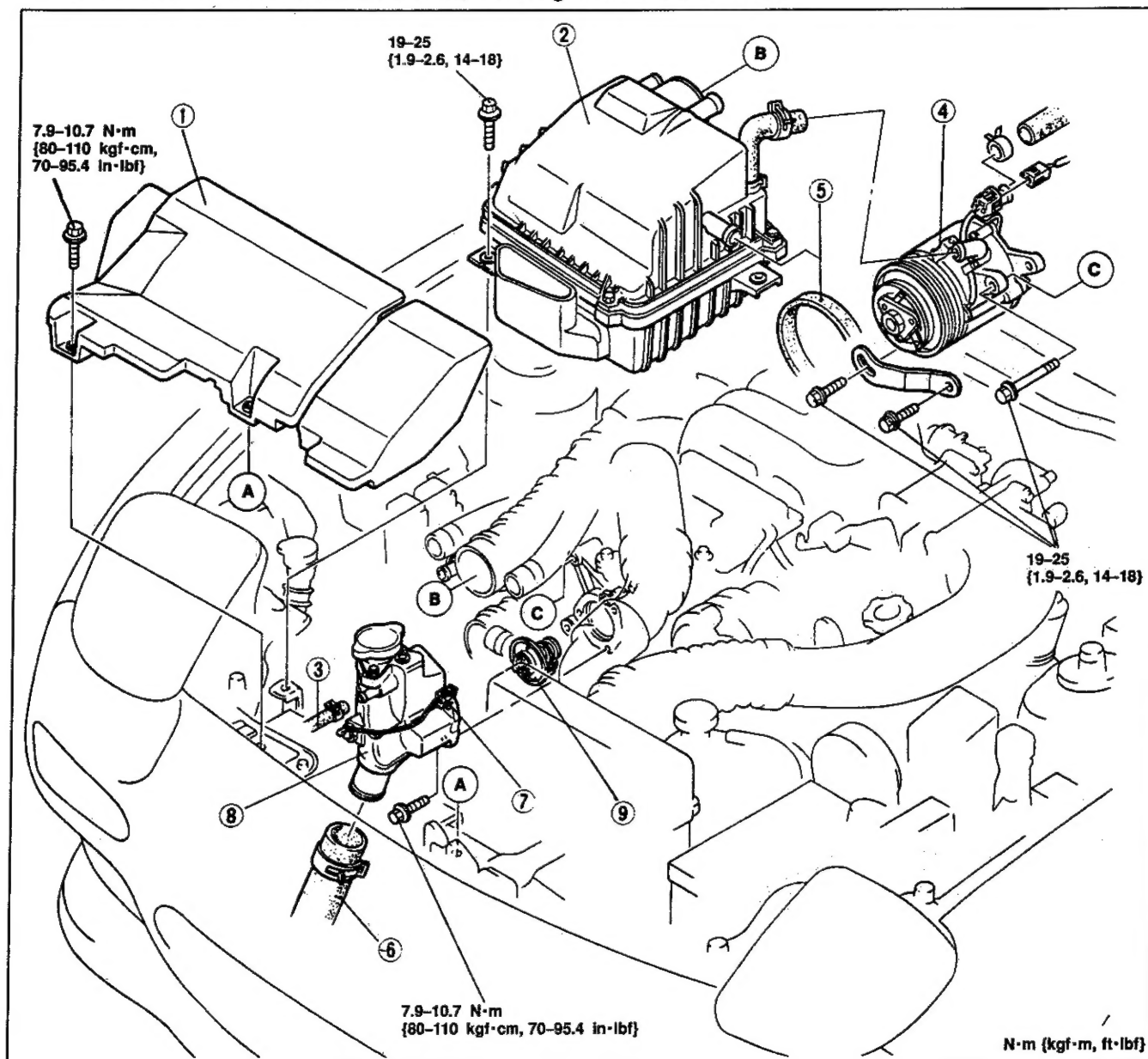
### Steps After Installation

1. Fill the radiator with the specified amount and type of engine coolant. (Refer to page E-5.)
2. Start the engine and check for leaks.

## THERMOSTAT

## REMOVAL / INSTALLATION

1. Disconnect the negative battery cable.
2. Drain the engine coolant. (Refer to page E-5)
3. Remove in the order shown in the figure.
4. Install in the reverse order of removal, referring to **Installation Note**.



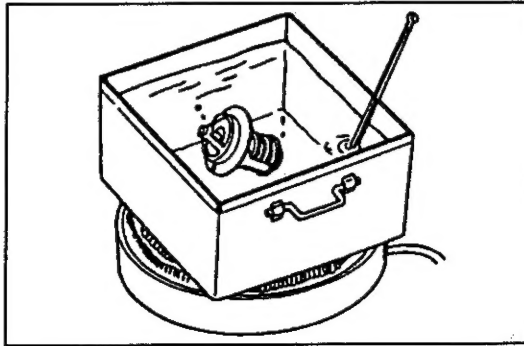
1. Fresh-air duct
2. Air cleaner housing
3. Water hose
4. Air pump
5. Drive belt

6. Radiator hose (upper)
7. Coolant level sensor connector
8. Thermostat cover
9. Thermostat and gasket

Removal/Installation ..... Section C

Inspection ..... page E-15  
Installation Note ..... page E-15





## INSPECTION

1. Visually check that the thermostat valve is airtight.
2. Place the thermostat and a thermometer in water.
3. Heat the water and check the following.

**Initial-opening temperature:**

**80.5–83.5°C {177–182°F}**

**Full-open temperature: 95°C {203°F}**

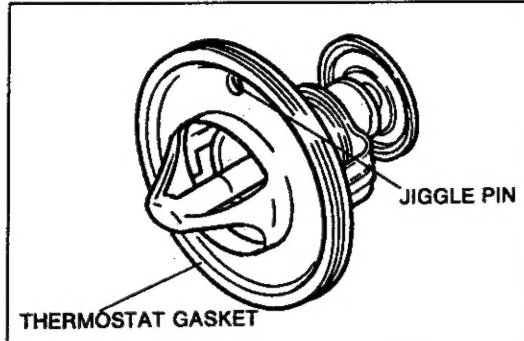
**Full-open lift: 8.0–10 mm {0.31–0.39 in} min.**

4. Check the thermostat gasket; if damaged, replace the thermostat assembly.

## Installation Note

### Thermostat

Install the thermostat into the thermostat case with the jiggle pin at the top.



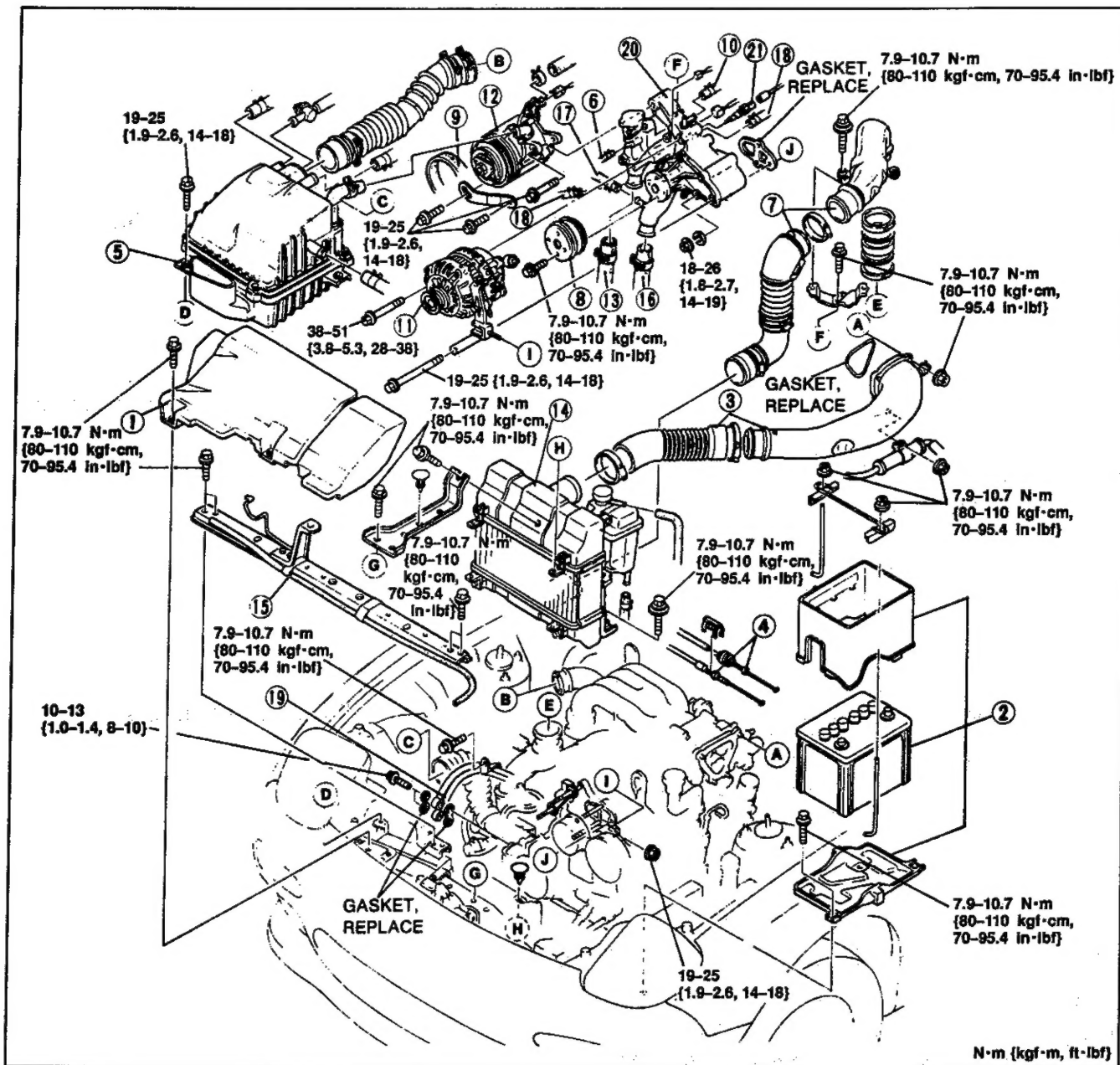
## Steps After Installation

1. Fill the radiator with the specified amount and type of engine coolant. (Refer to page E-5,6.)
2. Connect the negative battery cable.
3. Start the engine and check for leaks.
4. Bleed the cooling system. (Refer to page E-6.)

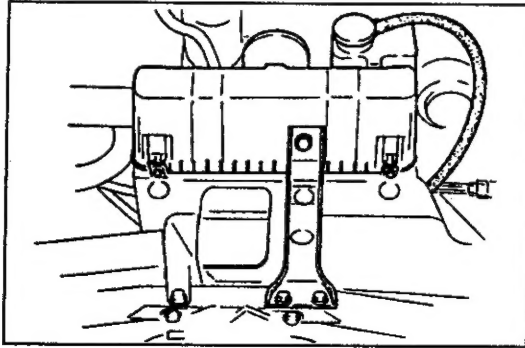
# WATER PUMP AND WATER THERMOSENSOR

## REMOVAL / INSTALLATION

1. Disconnect the negative battery cable.
2. Drain the engine coolant. (Refer to page E-5)
3. Remove in the order shown in the figure (page E-16), referring to **Removal Note**.
4. Install in the reverse order of removal.

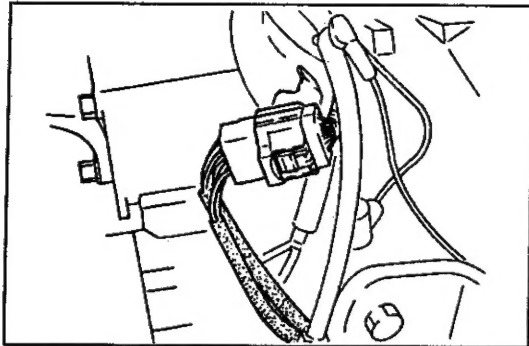


- |                                      |   |
|--------------------------------------|---|
| 1. Fresh-air duct                    | 11. Alternator and strap                      |
| 2. Battery and carrier               | 12. Air pump and strap                        |
| 3. Air funnel and air hose           | 13. Radiator hose (upper)                     |
| 4. Accelerator cable                 | 14. Charge air cooler and air separation tank |
| Service ..... Section F              | Removal Note ..... page E-17                  |
| 5. Air cleaner housing               | 15. Subframe                                  |
| 6. Water hose (filler port)          | 16. Radiator hose (lower)                     |
| 7. Air pipe and air hose             | 17. Heater hose                               |
| 8. Water pump pulley                 | 18. Water hose (water pump body)              |
| 9. Drive belt                        | 19. Metering oil tube                         |
| Removal/Installation ..... Section C | 20. Water pump and pump body                  |
| 10. Water hose (water pump body)     | Removal Note ..... page E-17                  |
|                                      | 21. Water thermostat                          |
|                                      | Inspection ..... page E-17                    |
|                                      | Installation Note ..... page E-17             |



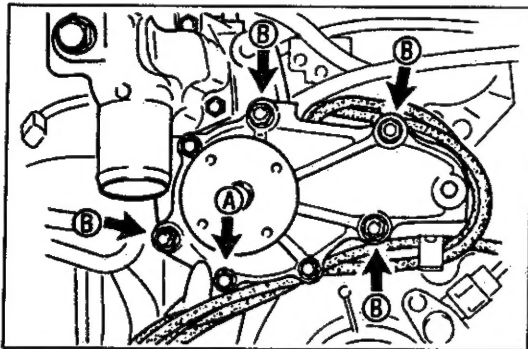
## Removal Note

**Charge air cooler and air separation tank**  
Do not remove the air duct from the body.

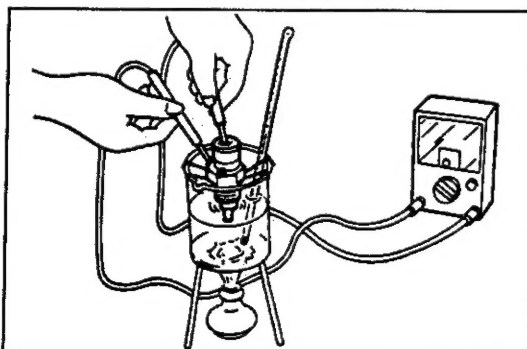


## Water pump and pump body

1. Remove the metering oil pump connector from the engine hanger.



2. Remove the bolt (A) shown in the figure.
3. Position the metering oil tube and metering oil pump harness under the lower radiator hose.
4. Remove the nuts (B) shown in the figure.
5. Remove the water pump and pump body.



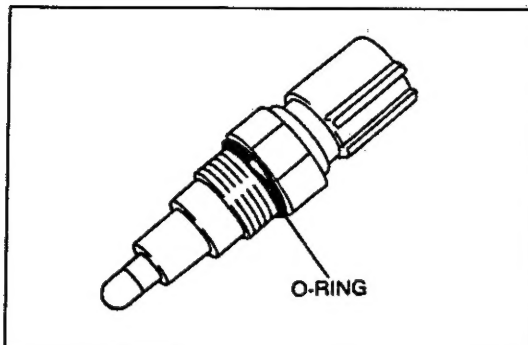
## INSPECTION

### Water Thermosensor

1. Place the switch and a thermometer in water.
2. Heat the water gradually and check resistance of the switch.

Coolant	Resistance
101°C (214°F)	0.5 Ω max.
108°C (236°F)	1 MΩ min

3. If not as specified, replace the water thermosensor.



## Installation Note

### Water thermosensor

1. Apply a small amount of engine coolant to the new O-ring.
2. Install the water thermosensor.

## Tightening torque:

5.9–8.8 Nm {60–90 kgf·cm, 52–78 in·lbf}